Claims

1. A method for incrementally coding and signalling motion information for a video compression system involving a motion adaptive transform and embedded coding of transformed video samples, said method comprising the steps of:
(a) producing an embedded bit-stream, representing each motion field in coarse to fine fashion; and
(b) interleaving incremental contributions from said embedded motion fields with incremental contributions from said transformed video samples.

2. The method of Claim 1, where the embedded motion field bit-stream is obtained by applying embedded quantization and coding techniques to the motion field parameter values.

3. The method of Claim 1, where the embedded motion field bit-stream is obtained by coding the node displacement parameters associated with a triangular mesh motion model on a coarse to fine grid, each successive segment of the embedded bit-stream providing displacement parameters for node positions which lie on a finer grid than the previous stage, all coarser grids of node positions being subsets of all finer grids of node points.

4. The method of claim 3, where a coarse to fine motion representation is obtained by first transforming the motion parameters and then coding the transform coefficients using embedded quantization and coding techniques.

5. The method of claim 4, where the motion parameters are transformed by applying spatial discrete wavelet transforms and/or temporal transforms thereto.

6. The method of claim 5, wherein the spatial and/or temporal transforms are reversible integer-to-integer transforms, suitable for lossless compression.

7. The method of any one of claims 1 to 6, wherein the embedded motion bit-streams are arranged into a sequence of quality layers, and the transformed video samples are also encoded into embedded bit-streams which are arranged into a separate sequence of quality layers.

8. The method of any one of claims 1 to 7, where said interleaving of the

contributions from the embedded motion bit-streams and from the transformed video samples is performed in a manner which minimizes the expected distortion in the reconstructed video sequence at each of a plurality of compressed video bit-rates.

9. The method of Claim 8, where the measure of distortion is Mean Squared Error.

10. The method of Claim 8, where the measure of distortion is a weighted sum of the Mean Squared Error contributions from different spatial frequency bands, weighted according to perceptual relevance factors.

11. The method of any one of claims 8 to 10, where the distortion associated with inaccurate representation of the motion parameters is determined using an estimate of the spatial power spectrum of the video source.

12. The method of any one of claims 8 to 11, where the distortion associated with inaccurate representation of the motion parameters is determined using information about the spatial resolution at which the video bit-stream is to be decompressed.

13. The method of claim 11, where the power spectrum of the video source is estimated using spatio-temporal video sample subbands created during compression.

14. The method of any one of the preceding claims, wherein the proportions of contributions from said embedded motion fields and said transformed video samples in the embedded bit-stream is determined on the basis of a plurality of tables associated with each frame, each table being associated with a spatial resolution at which the video bit-stream is to be decompressed.

15. The method of claim 14, wherein the embedded motion bit-streams and the transformed video samples are each encoded as a series of quality layers and the tables identify the number of motion quality layers are to be included with each number of video sample quality layers.

16. A method for estimating and signalling motion information for a motion adaptive transform based on temporal lifting steps, said method comprising the steps of:

(a) estimating and signalling motion parameters describing a first mapping from a source frame onto a target frame within one of the lifting steps; and
(b) inferring a second mapping between either said source frame or said target frame, and another frame, based on the estimated and signalled motion parameters associated with said first mapping.

17. The method of claim 16, where said second mapping is the reciprocal mapping from said target frame to said source frame, for use within another one of the lifting steps.

18. The method of claim 17, where said reciprocal mapping is the inverse of the first mapping.

19. The method of Claim 16, where the motion parameters of said first mapping correspond to a deformable triangular mesh motion model.

20. The method of Claim 19, where said reciprocal mapping is inferred by inverting the affine transformations associated with the triangular mesh used to represent said first mapping.

21. The method of Claim 16, where the motion parameters of said first mapping correspond to a block displacement motion model.

22. The method of any one of claims 16 to 21, where said motion adaptive transform involves multiple stages of temporal decomposition, corresponding to different temporal frame rates.

23. The method of Claim 22 where motion parameters at each temporal resolution are deduced from original video frames.

24. The method of claim 22 or 23, wherein said second mapping is a mapping between frames at a lower temporal resolution than said first mapping, and said second mapping is inferred by compositing the first mapping with at least one further mapping between frames at the higher temporal resolution.

25. The method of claim 22 or 23, wherein said second mapping is a mapping between frames at a higher temporal resolution than said first mapping, and said second

mapping is inferred by compositing the first mapping with at least one further mapping at the higher temporal resolution.

26. The method of claim 25, wherein said higher resolution is double said lower resolution, and alternate mappings at the higher temporal resolution are explicitly signalled to a decompressor, the remaining mappings at the higher temporal resolution being replaced by the mappings inferred by compositing the lower resolution mappings with respective higher resolution mappings.

27. The method of Claim 26, where said replaced mappings are used within the lifting steps of said motion adaptive transform, in place of the originally estimated mappings which were replaced.

28. The method of Claim 26 or 27, where said replaced mappings are refined with additional motion parameters, said refinement parameters being signalled for use in decompression, and said replaced and refined mappings being used within the lifting steps of said motion adaptive transform, in place of the originally estimated mappings which were replaced.

29. The method of any one of claims 16 to 28, where inversion or composition of motion transformations is accomplished by applying said motion transformations to the node positions of a triangular mesh motion model, the composited or inverted motion transformation being subsequently applied by performing the affine transformations associated with said mesh motion model.

30. The method of claim 29, where the source frame is partitioned into a regular mesh and the inversion or composition operations are applied to each node of the regular mesh to find a corresponding location in the target frame, the composited or inverted motion transformation being subsequently applied by performing the affine transformations associated with said mesh motion model.

31. A computer program including instructions for controlling a computing system to implement the method of any one of claims 1 to 30.

32. A computer readable medium having stored thereon the computer program of claim 31.

33. A system for incrementally coding and signalling motion information for a video compression system involving a motion adaptive transform and embedded coding of transformed video samples, said system comprising:
(a) means for producing an embedded bit-stream, representing each motion field in coarse to fine fashion; and
(b) means for interleaving incremental contributions from said embedded motion fields with incremental contributions from said transformed video samples.

34. A system for estimating and signalling motion information for a motion adaptive transform based on temporal lifting steps, said system comprising:
(a) means for estimating and signalling motion parameters describing a first mapping from a source frame onto a target frame within one of the lifting steps; and
(b) means for inferring a second mapping between either said source frame or said target frame, and another frame, based on the estimated and signalled motion parameters associated with said first mapping.